VAC-TRON EQUIPMENT

MASTRY ENGINE CENTER LLC
A YANMAR COMPANY

Vac-Tron
System Control

Installation / User Manual

(1100010-10 Control Panel)

Mas-Technologies
Making the Propulsion, Control and Data Connection

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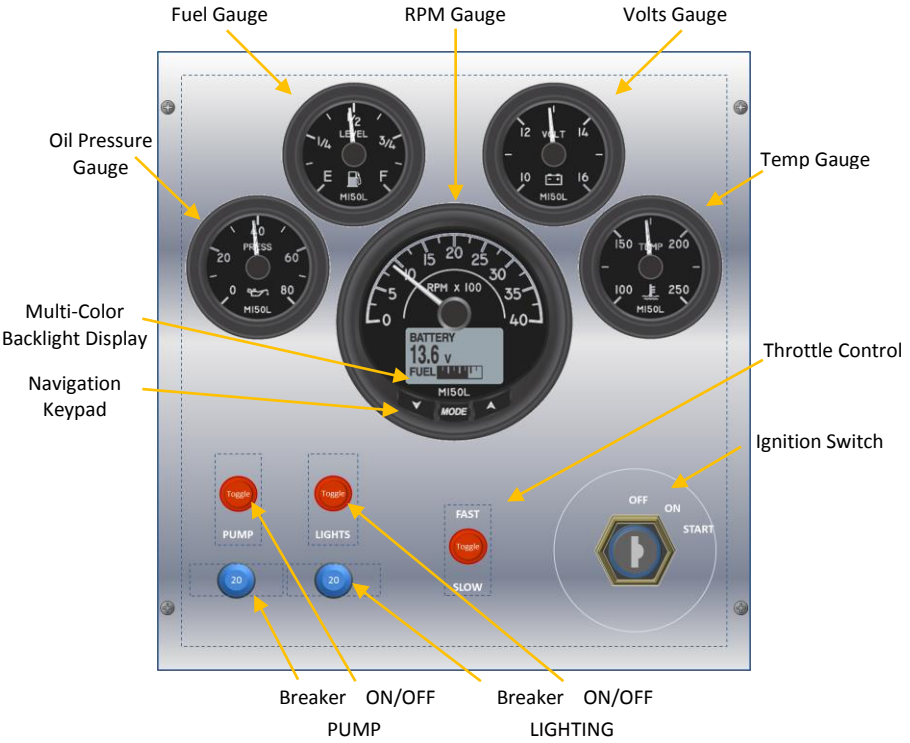
Quick Start Guide



The Control Panel is powered from the engine battery connection thru the engine harness connector. Make sure the engine harness is connected to the Control Panel before proceeding. To power the system turn the key switch to the “ON” position. This will activate the control panel and apply power to the engine ECU.

When powered the control panel digital display will show an introductory splash screen showing product model number, system revision level and date. (See display bottom left.) During this time a system self-check will be performed and the tachometer needle will complete a full sweep of the dial range. This will take approximately 5 seconds at which time the LCD display will present the default runtime data screen. Should the control panel sound an audible alarm OR the digital display indicate a fault condition do not start the engine. Review the fault condition and proceed to correct the fault. See Fault section of this manual for details on system faults.

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As shipped from the factory the default runtime display is configured to present maintenance hours. (See display bottom right.) The system is preconfigured to provide 21 data displays. The additional Viewing List of displays may be presented by pressing the "▼" or "▲" buttons. See Viewing Data section for description of all display information.

Should any Engine Fault be active on startup a fault pop-up window will be displayed. See Faults section for more information.

Starting the Engine

To start the engine, turn the key switch to the "Start" position. Should a fault condition exist the engine ECU may prevent the engine from starting. All fault conditions will be indicated by the digital display. The display will indicate the active fault(s) by presenting a pop-up graphic describing the fault condition.

Controlling Engine Speed

When the engine is started, the control panel "Fast / Slow" toggle switch setting will determine the engine speed. To change the engine speed simply toggle this switch to the desired setting. If the engine is started in the Fast position, the engine will start and run at the SLOW setting for 15 seconds then increase to the FAST setting.

Water Pump Control

This toggle switch activates the water pump and is labeled "Pump". To turn on the water pump toggle this switch to the upward position.

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Lighting

The lighting switch has three (3) positions; ON-OFF-ON*ON.

Up Position: Lights + DOT Strobe
Center Position: OFF
Down Position: DOT Strobe only

Engine Data

The M154L Control Panel reads and displays 21 unique data parameters. The panel round gauges provide constant viewing of important system parameters. The master control gauge provides engine speed data while oil pressure, coolant temperature, system voltage and fuel level are provided with the digital 2" gauges. The master control gauge LCD allows the user to select any of the 21 data parameters for viewing. If desired, the LCD can be configured to rotate through all data parameters automatically.

Alarms

All currently active and stored system alarms can be viewed from the "FAULT CODES" menu. See Fault Codes Section.

By-Pass Switch

This is a momentary switch which overrides the low water level float switch lockout. Activating the by-pass switch allows the operator to run the water pump when water level is low. To operate the by-pass circuit start the engine, turn the "Water" switch to the "ON" position and the press the by-pass switch. This is necessary to properly winterize or ready the system for long shutdown periods when all water must be drained from the equipment.

Menu Navigation

The Mode Button is multi-functional and is used as an escape and enter key. When the Mode key is pressed for less than 1 second it is considered an escape action. When pressed for greater than 1 second is considered an enter function. For example, to enter a menu selection or save an entered value the button must be pressed and held for greater than 1 second. When escaping a menu selection, momentary Mode Button presses are used. The only exception to these actions is entering the main menu. From any runtime data display screen a momentary press of the Mode Button will activate the main menu.

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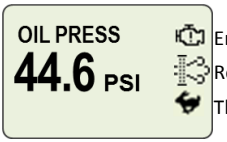
Main Menu

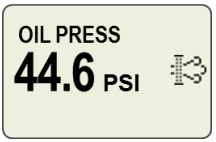
The Main Menu allows the user to access all areas of the Control System. To access the Main Menu press the Mode button. To access menu items highlight the desired selection using the "▼" or "▲" keys and press & hold the Mode button for 1 second.

System I/O Indicators

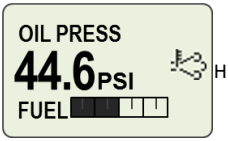
The control system provides constant monitoring of critical system inputs and indicates the status of these inputs on the controller display. The external engine shutdown, Engine DTC, throttle switch, DPF ReGen requested, Inhibit DPF ReGen and Exhaust Temp High inputs are assigned to the status icons. The presence of the ICON indicates the input is active.



Engine DTC
Regen Status
Throttle Status



DPF Regen Requested



High Exhaust Temp

DPF Regen Inhibited

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System Operation

Audible Alerts

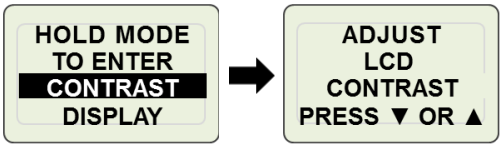
Audible alerts can be activated for several reasons;

1) Active Fault(s)
2) Acknowledged Active Fault reminder
3) Button Press
4) Setting Saved
5) Warning

Audible alerts for button presses, setting saved and warning beeps are configurable and can be turned on or off from the System / Audio menu. To configure audio settings enter Main Menu then scroll to System entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to select System menu. Scroll to Audio entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to enter Audio Menu. Use "▼" or "▲"buttons to select audio menu entry to configure.

Contrast Menu

The Contrast Menu allows the user to adjust the display contrast settings. Enter Main Menu then scroll to the Contrast entry using "▼" or "▲"buttons. Select Contrast and adjust contrast using "▼" or "▲" buttons.



Custom Alarms

Fuel Level

A low fuel warning is configurable by the operator as a custom alarm. This warning will occur when the system fuel level drops below the value configured for this setting. This is a preventative measure to warn the operator that the fuel level is getting low. Should this message occur check the fuel level to determine if sufficient fuel is available. When the fuel level exceeds the value configured the warning message is automatically removed. This warning is generated by the control module and does not affect system operation in any way. This

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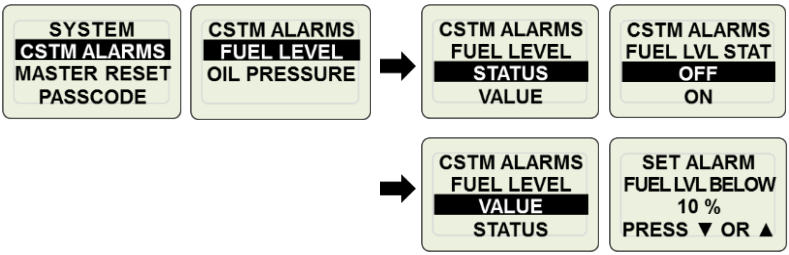
warning will be displayed anytime the fuel level drops below the level described above.

Note: The fuel level reading must be below the set-point value by .4% for > 10 seconds before alarm will sound. Fuel level reading must be above set-point value by 2% for > 10 seconds for the alarm to clear.

To select the custom alarm for fuel level enter the Main Menu then scroll to the System menu entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to select the System menu. Scroll to the "CSTM ALARM" entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to enter custom alarm menu selection (fuel level or oil pressure). Use "▼" or "▲"buttons to select the desired alarm. Press & hold Mode button for > 1 second to enter the desired menu. The alarm can be activated or de-activated from the "Status" menu selection. The alarm set-point is set from the "Value" menu selection.



Oil Pressure

A low oil pressure warning will occur when the oil pressure drops below the value configured for this setting. Should this message occur check the oil level to determine if the engine has sufficient oil available. When the oil pressure exceeds the value configured the warning message is automatically removed. This warning is generated by the control module and does not affect system operation in any way. This warning will not be displayed until the operator starts the engine OR the oil pressure drops below the pressure described above, while the engine is running.

Note: The oil pressure reading must be below the set-point value by .4% for > 10 seconds before alarm will sound. Oil Pressure reading must be above set-point value by 2% for > 10 seconds for the alarm to clear.

To select the custom alarm for oil pressure enter the Main Menu then scroll to the System menu entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to select the System menu. Scroll to the "CSTM ALARM" entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to enter custom alarm menu selection (fuel level or oil pressure). Use "▼" or "▲"buttons to select the desired alarm. Press & hold Mode button for > 1 second to enter the desired alarm menu. The

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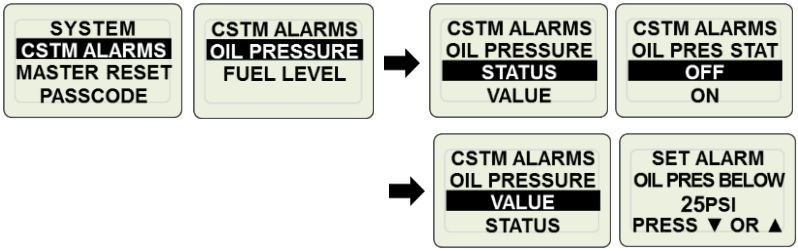
alarm can be activated or de-activated from the “Status” menu selection. The alarm set-point is set from the “Value” menu selection.



DPF Regeneration

DPF (Diesel Particulate Filter) is used to filter particulates from the exhaust of diesel engines. Overtime this filter begins to clog as a result of unburned soot in the exhaust. When this occurs the engine determines the state of the filter and engine performance and broadcasts a message to indicate the status of the system regeneration. Regeneration removes the excess particulate matter and returns the engine to its maximum performance.

DPF ICONS and Actions

= DPF Regeneration Requested. This icon is activated when the engine sends a CANBus message to the control panel indicating the DPF has become restricted.

= DPF Regeneration Inhibited. This icon is activated when the engine sends a CANBus message to the control panel indicating DPF regeneration is inhibited.

= DPF Regeneration Active. This icon is activated when the engine detects High Exhaust Temperature due to regeneration.

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Regeneration Modes

The Yanmar Tier 4F engine has 4 types of regeneration states.

- **Automatic or Reset** – This is the most common regeneration state and occurs without operator intervention.
- **Manual** – This regeneration state is initiated by the operator through the control panel menu. Manual regeneration can be initiated by the operator at any time as long as the engine has run at least 50 hours since the last regeneration cycle.
- **Stationary** – This regeneration state is more serious. Continued engine operation with this request active will ultimately cause the engine to enter a recovery state and enter limp mode. This state will be entered should the operator continue to operate the engine with regeneration inhibited while ignoring the control system requests for regeneration.
- **Recovery** – Recovery regeneration is entered when the engine cannot perform regeneration. When in this mode the engine will enter a limp home mode limiting engine operation. It recommended that the operator perform regeneration immediately.

The regeneration process requires the operator to provide inputs to the control system in order for the regeneration process to activate. The control system reduces the complexity of this process by guiding the operator through a series of display prompts. Each display prompt presents to the operator the input choices available by using softkeys. The softkey entry will be located directly above the button associated with this entry. In the example shown below, the "▼" button represents "Allow". The " ▲" button represents "Delay".

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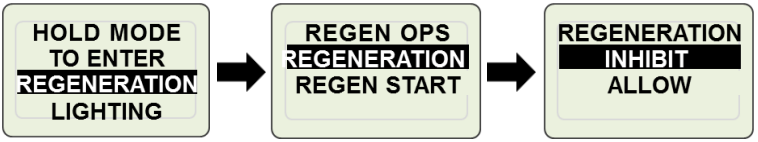
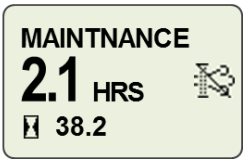
Regeneration Inhibit

The control system allows the operator to manually inhibit DPF regeneration through the regeneration menu. The DPF Regeneration Menu can be accessed from the main menu by selecting “Regeneration”. This selection allows the user to choose regeneration “Inhibit” or “Allow”.



Note: System indication that regeneration has been inhibited by operator.



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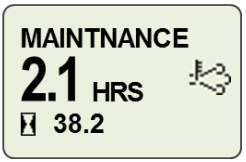
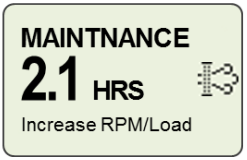
Automatic Regeneration

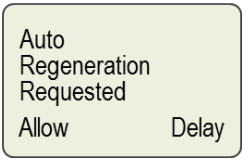


Active: Automatic Or Reset Regeneration is performed when normal engine operation provides sufficient exhaust temperatures AND regeneration is not inhibited by the operator. During this process a "High Exhaust Temperature" icon will be displayed warning the operator that high exhaust temperatures are present.

Regeneration Inhibited due to Low Exhaust Temp:
Should regeneration be required but the exhaust temperature is too low the control system will generate a display showing regeneration is requested. This condition is typically a result of insufficient engine loading. The control system indicates to the operator that engine load should be increased.



Should regeneration be required but regeneration has been delayed or inhibited by the operator the control system will generate a display indicating that "Auto Regeneration Requested". When alerted the operator will be given a choice to allow the regeneration process to proceed or continue to delay the regeneration process.



When the operator selects "Allow" the control panel will guide the operator through an interactive sequence of displays to start the regeneration process. See Automatic Regeneration Flow Diagram.

Selecting "Delay" will continue to inhibit the regeneration process. The main display will indicate inhibited regeneration by displaying the regeneration inhibited indicator. While in the delay state, the M154L Control System will pop-up the Auto Regeneration Requested display every 30 minutes.

Note: Continuing to delay regeneration will cause the engine to eventually proceed to a more immediate regeneration state ("Stationary Regeneration"). When in this mode the engine must be parked and normal operation will not be allowed.

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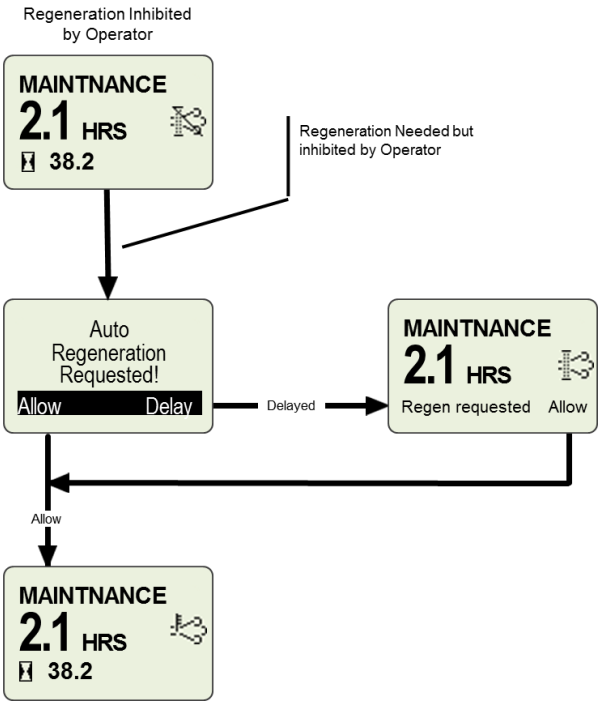
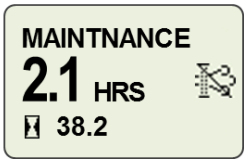
Automatic Regeneration Flow Diagram



When regeneration is active the control system will indicate regeneration is active by displaying the high exhaust temperature indicator.

Note: The operator can stop the Automatic Regeneration process at any time by accessing the main menu and selecting regeneration inhibit. The control system will activate the regeneration inhibited ICON.



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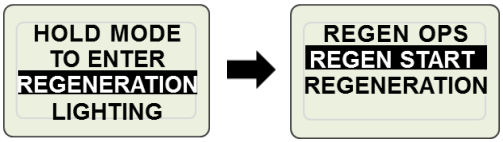
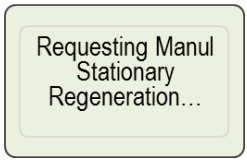
Manual Regeneration

Manual Regeneration allows the operator to decide when and where to perform the regeneration process.

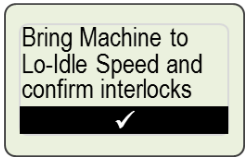
Initiating: The control system provides a menu selection to initiate this process.



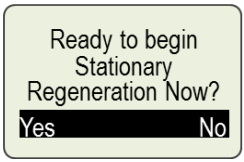
Requesting: When manual regeneration has been initiated by selecting "Regen Start", the control system will provide a prompt indicating that it is requesting the engine to enter manual regeneration mode.



Proceeding: The operator will be guided through a series of display prompts before engine regeneration has been activated. The first prompt will ask the operator to reduce the engine throttle speed to the minimum rpm value. To set the minimum rpm value set the throttle switch to the slow setting. The operator will also be asked to confirm all interlocks have been set. Interlock settings are prewired from the factory and no additional input is needed from the operator for this setting. The operator must acknowledge this prompt by momentarily pressing the "✓" softkey. If all conditions are met the control system will command the engine to the "initiate regeneration rpm value". This value is configured within the ECU, cannot be changed and may vary from model to model. For most models this value is 800 rpm.



Confirming or Initiating from Delay: The control system proceeds to prompt the operator with a regeneration confirmation screen. This is a final confirmation by the operator that regeneration is requested. The operator has the choice to begin regeneration by selecting the "Yes" softkey or exiting the regeneration request by selecting the "No" softkey.



Continuing with the regeneration request by selecting "Yes" will command the engine to enter regeneration mode. The control system will display a waiting prompt until the engine acknowledges the manual regeneration state.

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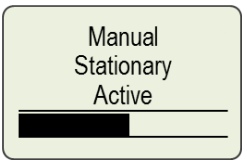
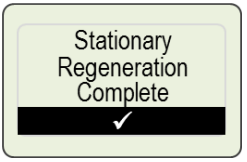
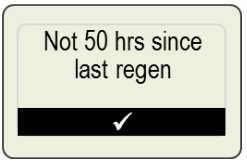


Active: When the manual regeneration state is active the control system will display a timer showing the progress of the manual regeneration state. The time to complete manual regeneration will vary based on the level of cleaning process that is needed. The maximum time is 30 minutes. Manual regeneration can be stopped at any time by entering the regeneration menu and selecting regeneration inhibit.

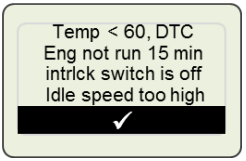
Note: The regeneration process increases engine rpm. The throttle switch will not control rpm during this time. Care should be taken to ensure all safety measures are met before proceeding to the regeneration process.



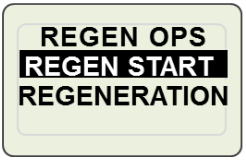
Complete: When manual regeneration is complete the control system will provide a prompt indicating completion. The engine will return to the minimum engine rpm value and be ready to return to normal operation. The operator must acknowledge the prompt by momentarily pressing the "✓" softkey.



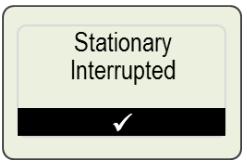
Not 50hrs Since Last Regen: Manual regen will not be allowed if less than 50hrs of engine operation have occurred since the last regeneration cycle. Should this condition exist the control system will prompt the operator of this condition.



Conditions Not Met: If either condition, engine rpm not lowered to the "slow" rpm setting or the interlock mechanism is not set the engine will not enter the regeneration process. The control system will prompt the operator if this condition exists. The operator must acknowledge this display. When acknowledged the control system will cycle back to the start of this sequence. See manual regeneration flow diagram.



Exiting the manual regeneration request by selecting "No" will take the operator back to the regeneration menu. At time the operator can re-enter the regeneration start sequence or exit the regeneration menu and proceed to normal operation.



Aborting: Should the operator need to abort the stationary regeneration process while it is active entering the regeneration menu and selecting inhibit will abort the process. When the engine has recognized the abort command the control system will display "Stationary Interrupted".

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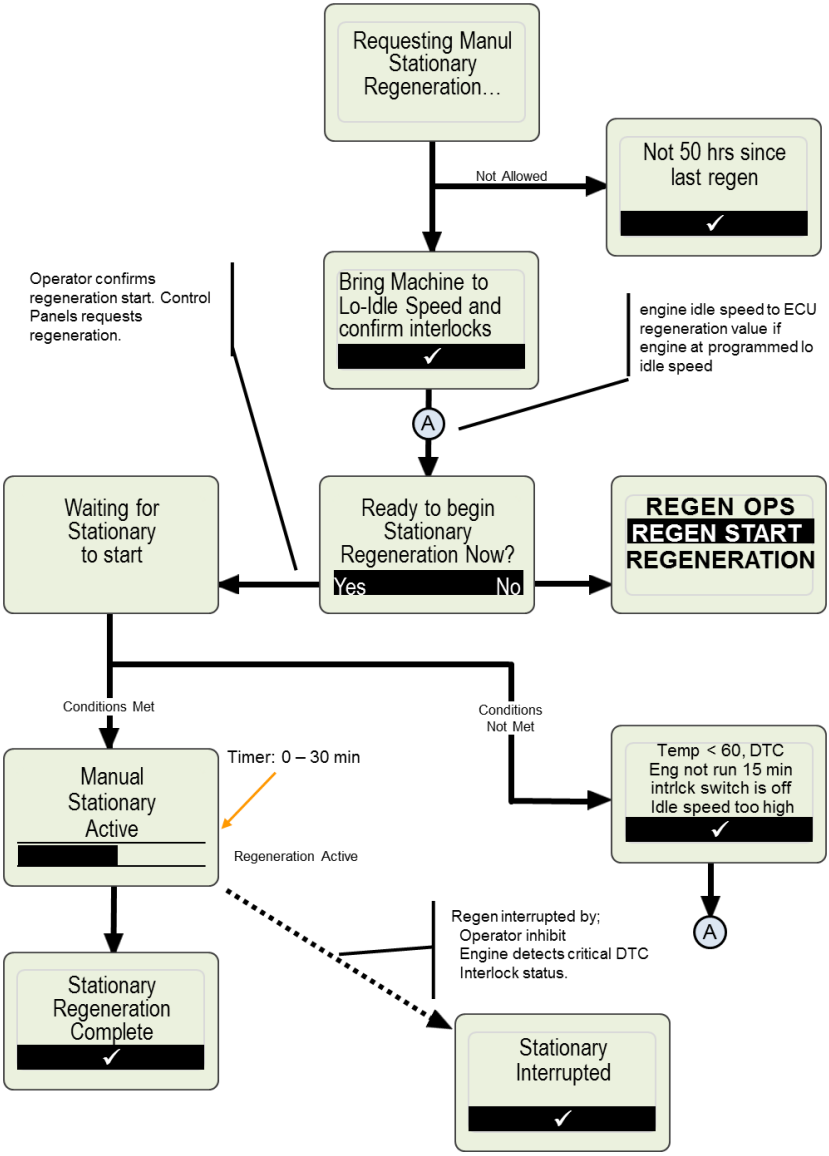
Manual Regeneration Flow Diagram



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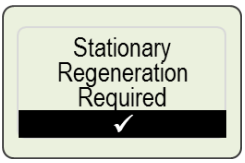
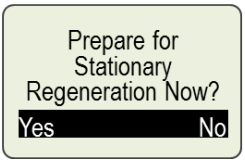
Stationary Regeneration

Stationary Regeneration is required when normal operation of the engine has prevented automatic regeneration to occur. This condition can occur due insufficient engine loading or operator intervention by inhibiting the regeneration process. This is a more serious condition and requires operator intervention to initiate the regeneration process.

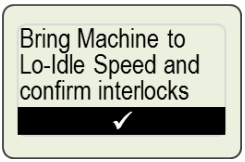
Initiating: The control system will alert the operator that stationary regeneration is needed by displaying an alert display indicating 'Stationary Regeneration Required". This alert will activate even if regeneration has been inhibited. The operator must acknowledge this alert to continue. Acknowledgement of this alert is completed by pressing the "✓" softkey.



The operator will then be prompted to "Prepare for Stationary Regeneration" or continue to delay the regeneration process. Selecting the "Yes" softkey will proceed with the stationary regeneration process with the control system guiding the operator through a series of interactive prompts.



Proceeding or Initiating from Delay: The first display prompts the operator to reduce the engine throttle speed to the minimum rpm value. To return the engine to the minimum rpm value use the throttle switch "Slow" position and adjust the engine speed to the programmed min rpm setting. (See engine menu for details on configuring min engine speed.)



The prompt also reminds the operator confirm that all interlocks have been set. (Note: Interlocks are application specific, are hardwired into the engine harness and are not controlled by the control panel.) The operator must acknowledge this prompt by momentarily pressing the "✓" softkey.

Confirming: The operator will be prompted by the control system to begin the regeneration process. This is a final confirmation by the operator that regeneration is requested. The operator has the choice to begin regeneration by selecting the "Yes" softkey or exiting the regeneration request by selecting the "No" softkey. If all conditions are met the control system will command the engine to the "initiate regeneration rpm value". This value is configured within the ECU and cannot be changed. This value may vary by engine model. For most models this value is 800 rpm.

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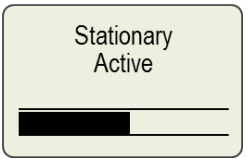
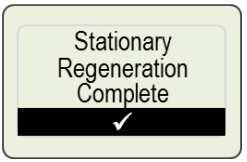
Continuing: Continuing with the "Ready to Begin Regeneration" request by selecting "Yes" will command the engine to enter regeneration mode. The control system will display a waiting prompt until the engine acknowledges the stationary regeneration request and enters the regeneration state. Should all conditions not be met the control system will display a checklist of items for the operator to review. See conditions not met.

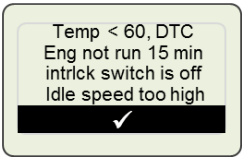


Active: When the stationary regeneration state has been activated the control system will display a timer showing the progress of the stationary regeneration state. The time to complete stationary regeneration will vary based on the level of cleaning process that is needed. The maximum time is 30 minutes. *(Note: Stationary regeneration can be stopped at any time by entering the regeneration menu and selecting regeneration inhibit.)*

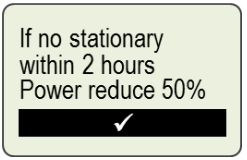
Note: The regeneration process increases engine rpm. The throttle switch will not control rpm during this time. Care should be taken to ensure all safety measures are met before proceeding to the regeneration process.



Complete: When stationary regeneration is complete the control system will provide a prompt indicating completion. The engine will return to the minimum engine rpm value and be ready to return to normal operation. The operator must acknowledge the prompt by momentarily pressing the "✓" softkey.



Conditions Not Met: If either condition, engine rpm not lowered to the "Slow" rpm setting or the interlock mechanism not set the engine will not enter the regeneration process. The control system will prompt the operator if this condition exists. The operator must acknowledge this display. When acknowledged the control system will cycle back to the start of this sequence. See Stationary Regeneration Flow Diagram.



Delaying: Delaying stationary regeneration is accomplished by selecting "No" to any of the prompts that ask the operator to continue with the regeneration process. Short delays of stationary regeneration are acceptable. This delay is utilized in situations where a machine needs to be moved to a more suitable location for the regeneration process. A system alert will occur informing the operator that engine power reduction will occur within 2 hours if stationary regeneration is not completed.

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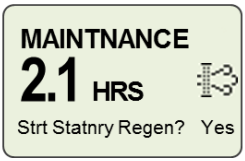
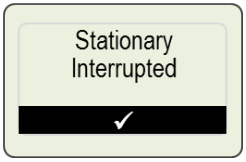
When the operators acknowledges the Power Reduce prompt the control panel returns to normal operation. The system will continue to remind the operator that stationary regeneration needs to be started.



Aborting: Should the operator need to abort the stationary regeneration process while it is active entering the regeneration menu and selecting inhibit will abort the process. When the engine has recognized the abort command the control system will display “Stationary Interrupted”. The operator must acknowledge this screen to return to normal operation.



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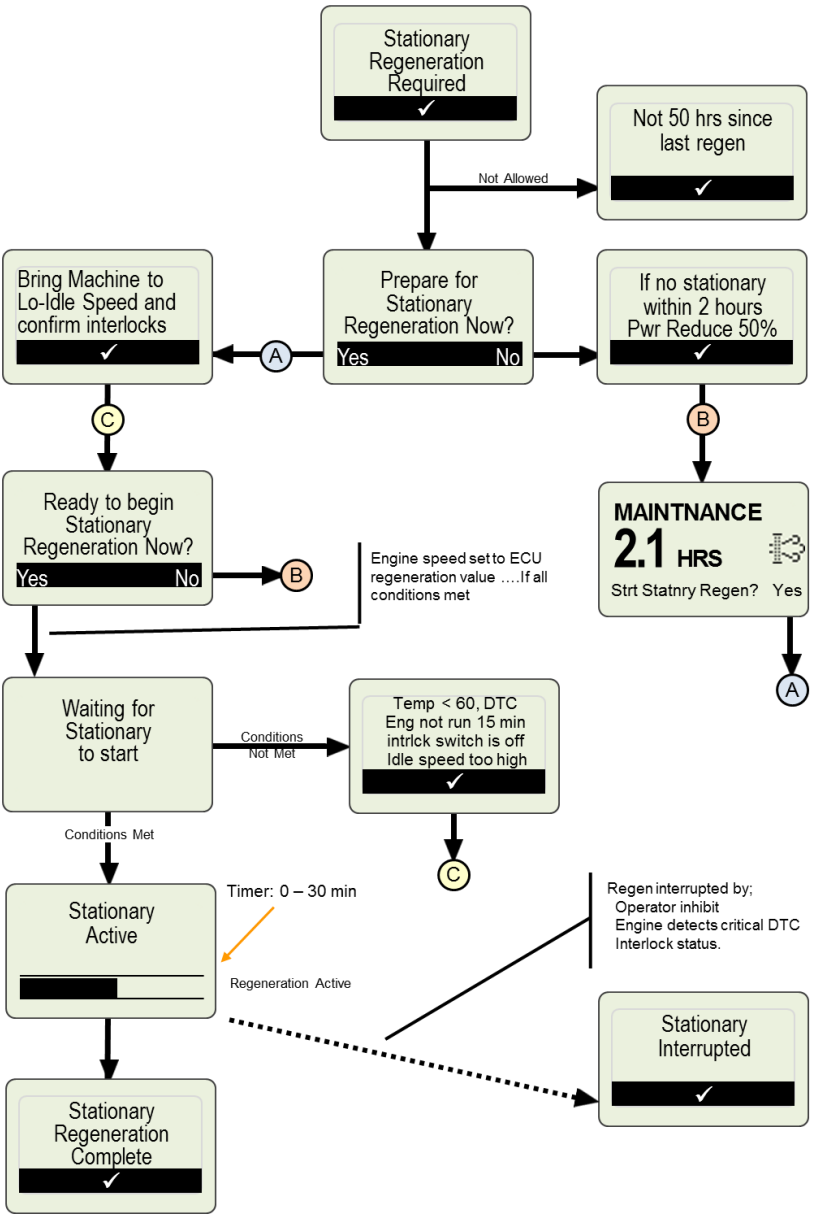
Stationary Regeneration Flow Diagram



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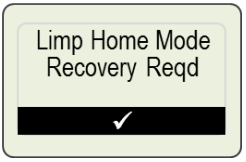
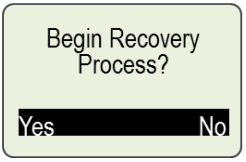
Recovery Regeneration

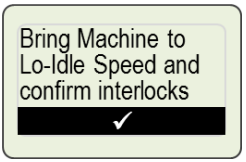
Recovery Regeneration is required when stationary regeneration is unable to be completed or has been inhibited for an extended period of time. The recovery regeneration state causes the engine to enter limp home mode preventing normal engine operation. This is the most serious regeneration condition and requires immediate operator intervention to initiate the regeneration process. Failure to initiate recovery regeneration could result in required DPF system service by an authorized engine technician.



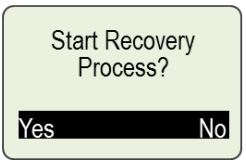
Initiating: The control system will alert the operator that recovery regeneration is required by displaying an alert display indicating 'Limp Home Mode Recovery Required". This alert will activate even if regeneration has been inhibited. The operator must acknowledge this alert to continue. Acknowledgement of this alert is completed by momentarily pressing the "✓" softkey.



The operator will then be prompted to begin the recovery process or continue to delay the regeneration process. Selecting the "Yes" softkey will proceed with the recovery regeneration process. Selecting the "No" softkey will delay the recovery regeneration process.



Proceeding Or Initiating from delay: The operator will be guided through a series of display prompts before engine regeneration has been activated. The first prompt will ask the operator to reduce the engine throttle speed to the minimum rpm value. To set the minimum rpm value set the throttle switch to the slow setting. The operator will also be asked to confirm all interlocks have been set. Interlock settings are prewired from the factory and no additional input is needed from the operator for this setting. The operator must acknowledge this prompt by momentarily pressing the "✓" softkey. If all conditions are met the control system will command the engine to the "initiate regeneration rpm value". This value is configured within the ECU, cannot be changed and may vary from model to model. For most models this value is 800 rpm.



Confirming: The control system proceeds to prompt the operator with a regeneration confirmation screen. This is a final confirmation by the operator that regeneration is requested. The operator has the choice to begin regeneration by selecting the "Yes" softkey or exiting the regeneration request by selecting the "No" softkey.

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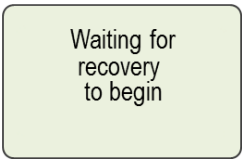
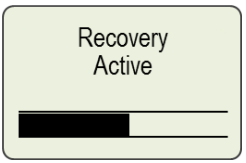
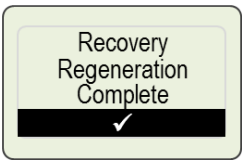


Continuing: Continuing with the regeneration request by selecting "Yes" will command the engine to enter regeneration mode. The control system will display a waiting prompt until the engine acknowledges the stationary regeneration state is active. Should all conditions not be met the control system will display a checklist of items for the operator to review.

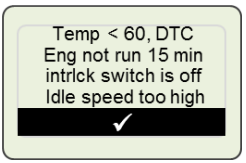


Active: When the recovery regeneration state is active the control system will display a timer showing the progress of the manual regeneration process. The time to complete stationary regeneration will vary based on the level of cleaning process that is needed. The maximum time is 3 hours. Stationary regeneration can be stopped at any time by entering the regeneration menu and selecting regeneration inhibit.

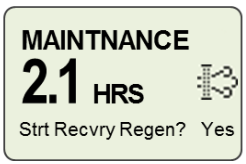
Note: The regeneration process increases engine rpm. The throttle switch will not control rpm during this time. Care should be taken to ensure all safety measures are met before proceeding to the regeneration process.



Complete: When recovery regeneration is complete the control system will provide a prompt indicating completion. The engine will return to the minimum engine rpm value and be ready to return to normal operation. The operator must acknowledge the prompt by momentarily pressing the "✓" softkey.



Conditions Not Met: If either condition engine rpm not lowered to the "slow" rpm setting or the interlock mechanism not set the engine will not enter the regeneration process. The control system will prompt the operator if this condition exists. The operator must acknowledge this display. When acknowledged the control system will cycle back to the start of this sequence. See recovery regeneration flow diagram.



Delaying: Delaying the recovery regeneration process should only occur to prepare the equipment for this process. This delay is utilized in situations where a machine needs to be moved to a more suitable location to complete the regeneration process. The engine will remain in limp home mode until the regeneration process can be completed.

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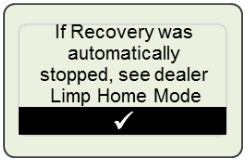

Aborting: Should the operator need to abort the recovery regeneration process while it is active the control system allows the operator to enter the regeneration menu and select regeneration inhibit. This will abort the process. When the engine has recognized the abort command the control system will display the warning prompt shown. The operator must acknowledge this screen to return to online system operation.

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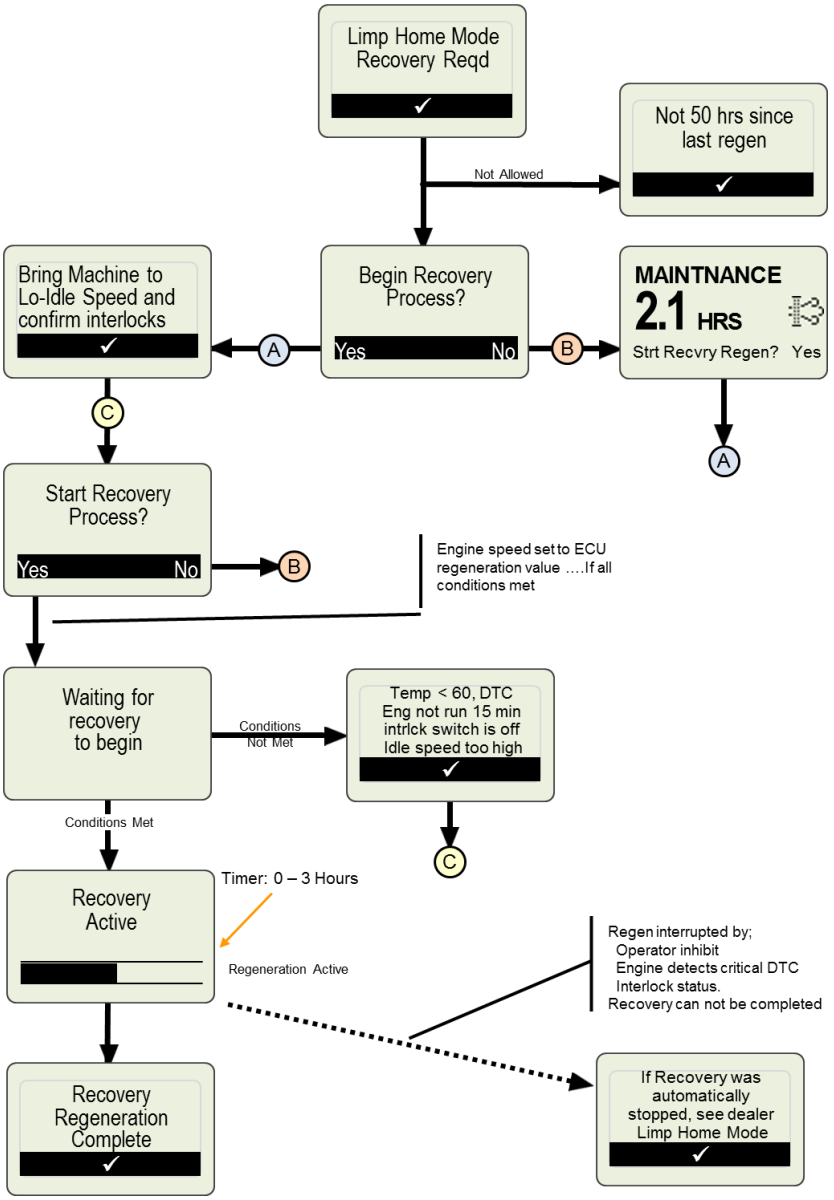
Recovery Regeneration Flow Diagram



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Fault Codes

Engine fault codes and status indications are generated from the engine ECU and communicated to the control panel via the CANBus communications link. The control panel reports the following faults and status information using descriptive text; engine over temperature, low oil pressure, system charge, High Exhaust Temperature, Inhibit DPF Regeneration, DPF Regeneration Requested, water in fuel, and communications failure. The engine ECU can generate additional fault codes and many engine manufacturers have engine specific codes. The control panel will present these additional codes as a “Check Engine” indication along with the SPN Number, FMI Code and fault count. Should a check engine fault be displayed the operator should access the Fault Code menu to determine the specific fault condition.

Active Fault Codes

All active system events (faults and warnings) are displayed on the LCD screen. Critical faults are backlight in Red. Warnings are backlight in Amber. Fault codes are accessed from the “Fault Codes” entry in the main menu. When a system fault occurs the display will activate a pop-up window describing the active fault condition and sound an audible tone. This pop-up will overlay on top of the currently active screen.

FAULT	DEFINITION
SYSTEM CHARGE	[1,2]Alternator not charging – ECU or M154L generated
ENGINE COMMUNICATIONS	[1]CANBus network failed – Engine ECU generated
CHECK ENGINE	[1]Engine Fault – Engine ECU generated
DPF Regeneration Requested	[2]Requested by the Engine
ENGINE TEMPERATURE HIGH	[1]Engine Temperature High – Engine ECU generated
SYSTEM VOLTAGE LOW	[1]ECU Voltage Low – Engine ECU generated
OIL PRESSURE LOW	[1]Engine Oil Pressure Low – Engine ECU generated [2]Engine Oil Pressure Low – M154L Custom Alarm
EXTERNAL ENGINE SHUTDOWN	[2]External Engine Shutdown – User generated

Table 1.0 – System Alarms

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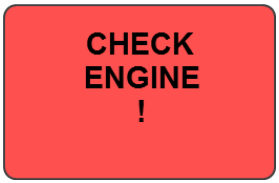
[1]Engine ECU may enter rpm limit mode or prevent engine from starting (this condition is controlled by engine ECU); fault may be generated without engine running.
[2] Engine continues to run – controlled by M154L control module; fault generated when engine started or engine is running.

Check Engine

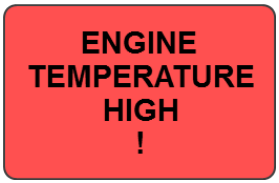


The “CHECK ENGINE” fault is a non-specific fault condition. This pop-up will occur when the engine generates any fault condition that is not specifically described in the fault section of this document. When a check engine fault occurs it is recommended that the operator go to the “Fault Codes” menu and review the detailed engine diagnostic data.

Engine Communications Failure

An “ENGINE COMMUNICATION FAILURE” is generated by the engine ECU. This fault occurs when the throttle speed control message (TSC1) is not received by the engine ECU at an acceptable update rate. This is typically 10msec.

Engine Over-Temperature



The “ENGINE TEMPERATURE HIGH” fault is generated by the engine ECU which reads a temperature sender located on the engine. When an over temperature condition is determined by the ECU a fault message is transmitted by the engine ECU indicating an engine temperature above normal exists. Details about the over temperature alarm can be viewed in the Fault Code menu.

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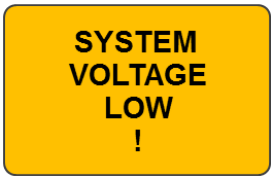
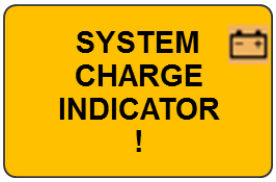
System Voltage Low



The “SYSTEM VOLTAGE LOW” warning is generated via the engine ECU. The engine ECU continuously monitors the ECU supply voltage to determine system voltage level. Should the system voltage become too low the engine ECU will indicate voltage below normal by transmitting a fault message to the control panel. The engine fault popup screen will indicate that the system voltage is low.

System Charge Indicator



A “SYSTEM CHARGE INDICATOR” warning will be displayed when it is determined the system is discharging. This condition can occur two ways;

1) If configured from the factory, the engine ECU detects the condition and sends a DM1 message indicating a charge warning Or …..

2) The M154L Control Module will provide a charge warning when the alternator field input is indicating a negative current flow. In either condition the system will indicate an active fault to notify the operator that the system needs attention.

Oil Pressure

The “OIL PRESSURE LOW” critical fault is typically generated by an oil pressure sender switch mounted on the engine. The engine ECU reads this switch and indicates an oil pressure fault OR oil pressure switch malfunction by transmitting a fault message to the control panel. The fault message has multiple definitions and could indicate oil pressure below normal or oil pressure sensor shorted or open. This message is received by the control panel and processed to the fault display. The display fault popup screen will indicate “OIL PRESSURE LOW” when an active oil pressure fault message is received. Details about the exact oil pressure failure can be viewed from the “Fault Codes” menu.

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Acknowledging Active Faults

When the control system receives a new fault, the digital display responds by overlaying a fault pop-up graphic onto the currently active runtime display. This allows the operator to respond to the fault condition and provide the necessary actions. The display to the right represents an unacknowledged fault for an oil pressure low condition.

Press & Hold
Mode Button
>1 second

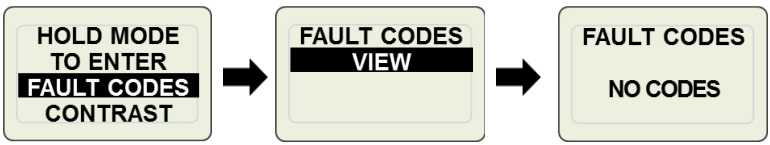
To acknowledge an active fault, press and hold the Mode button for greater than 1 second. This will remove the pop-up graphic and silence the audible fault indication. The control system will continue to backlight the LCD display indicating an active fault or warning exists.

Should the fault condition persist and not be acknowledged, the control system will "Auto" acknowledge the fault after 1 minute of continuous fault indication. An auto acknowledge produces the same result as the user performing an acknowledge.

Note: If the fault condition is cleared the associated pop-up will automatically be removed. If the fault condition remains and the fault has been acknowledged, the audible fault indication will be re-activated every 5 minutes for 2 seconds and then silence. This feature is a continuous reminder to the operator that a fault is present.

Stored Faults

To access fault codes, enter the Main Menu and then scroll to the Fault Code entry using "▼" or "▲" buttons. Press & hold Mode button for > 1 second to select the "Fault Codes" entry. Select "View". If no fault codes exist the system will indicate no codes.



If codes exist the system will display the Yanmar P Code Number and the status of the fault, Active or Stored. If multiple faults exist the system will allow the operator to scroll through the list using the "▼" or "▲" buttons.

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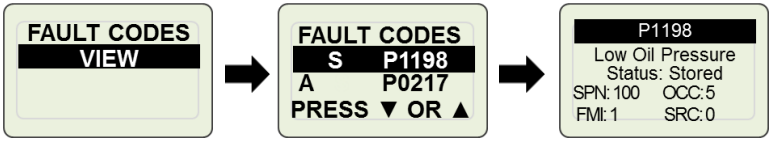
The control system fault code viewing menu provides a summary of the faults monitored by the control system. The system provides a combined list of “Active and Stored” faults. The viewing list is a summary containing the status of the fault (stored or active) and the designated PCode. To obtain more detailed information about any of the faults shown, highlight the fault in question, press and hold the “Mode” key for > 1 sec. The control system will provide more detailed information about the fault.



The detailed information presented is:

- Status (Active or Stored)
- SPN: J1939 SPN Number
- OCC: Number of occurrences
- FMI: Failure Mode Indicator
- SRC: Source address of device generating the fault

Maintenance Timer

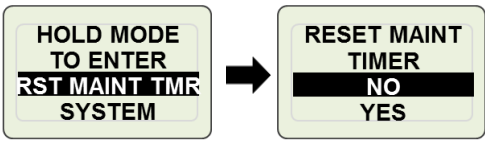
The maintenance timer display indicates the amount of engine runtime since last maintenance. If the system is powered but the engine is not running no maintenance hours will be accumulated. When the maintenance timer exceeds the configured time, the system will activate an “Engine Maintenance Required” alert popup. If the timer is not reset the alert popup will reinitiate on each key “ON” cycle.

Acknowledging Maintenance Timer

When the maintenance timer expires the control system will provide an alert popup indicating the maintenance time has expired. The alert will be cleared (acknowledged) by pressing and holding the Mode button. See acknowledging active faults section for more details. Accessing the maintenance timer reset menu via the “Hot Key” will also acknowledge the

Resetting Maintenance Timer

To reset the maintenance timer enter the Main Menu and then scroll to the “RST MAINT TIMER” entry using the “▼” or “▲”buttons. Press & hold Mode button for > 1 second to select reset maintenance timer menu. Using the “▼” or “▲”buttons select “YES” to reset the timer. Press & hold Mode button for > 1 second to enter the timer reset request.



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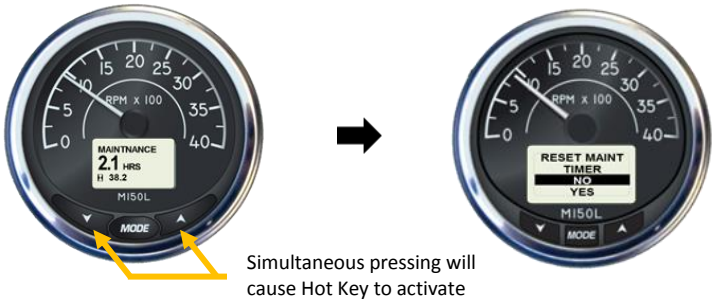
Resetting the maintenance timer can also be accomplished using a built-in “Hot Key”. The “Hot Key” entry is accomplished by simultaneously pressing the “▼” or “▲”buttons.



Setting Maintenance Timer

The maintenance timer is configurable and resettable by the operator. The timer will activate when set to a value > 0. To configure the maintenance timer enter the Main Menu and then scroll to the Engine entry using the “▼” or “▲”buttons. Press & hold Mode button for > 1 second to select the Engine menu. Scroll to the “MAINT TIMER” entry using “▼” or “▲”buttons. Press & hold Mode button for > 1 second to enter Maintenance Timer Menu. Use “▼” or “▲”buttons to set maintenance timer hours. Press & hold Mode button for > 1 second to enter the maintenance interval time. The timer has a settable range of 1-9999 hours. A setting of 0 hours turns off the timer.

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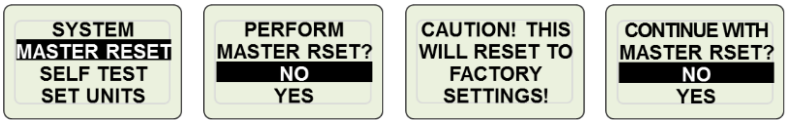
Master Reset

A Master Reset allows the user to set the control system back to factory default settings. Settings such as Maintenance Timer, Engineering Units and Audio settings will all be reset to their factory default settings when a master reset is completed.

To select Master Reset enter the Main Menu and then scroll to the System entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to select System menu. Scroll to "Master Reset" entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to activate the master reset program. The M154L will require two user confirmations before proceeding with the master reset application.



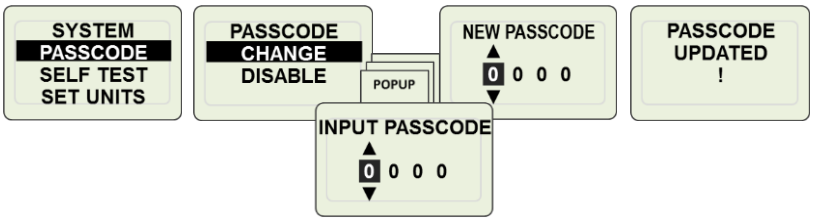
Note: Performing a master reset will NOT remove the Passcode. Should a passcode be active, the passcode must entered to perform a master reset. Once a passcode is entered it can only be changed by entering the current passcode and setting a new passcode.

Passcode

As shipped from the factory the control system passcode is active. To access the passcode contact your Vac-Tron authorized service technician. Setting the passcode to 0000 will disable it. Any non-zero value for the passcode entry enables it and therefore protects critical data parameters.

To select Passcode enter the Main Menu then scroll to the System entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to select System menu. Scroll to "Passcode" entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second enter passcode menu. The passcode menu allows the user to Disable or Change the current passcode configuration.

Changing the Passcode.



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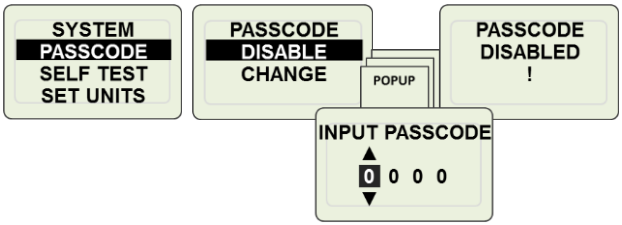
When the passcode protection is enabled the control system will prevent changes to the following parameters;

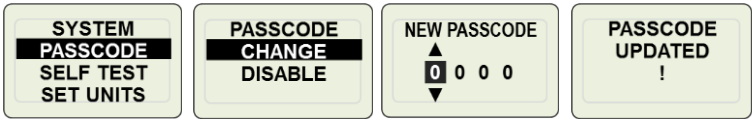
- Display Menu
  - # of Screens
  - Screen Setup
  - Line 2 Data
  - Auto Scroll
- Engine Menu
  - Droop
  - Set Min RPM
  - Set Max RPM
  - Maintenance Timer
- System Menu
  - Custom Alarms
  - Master Reset
  - Passcode

Disabling the Passcode.



Note: When changing or Enabling the passcode, the changes will not go into effect until the system has seen a power cycle.

Enabling the Passcode.



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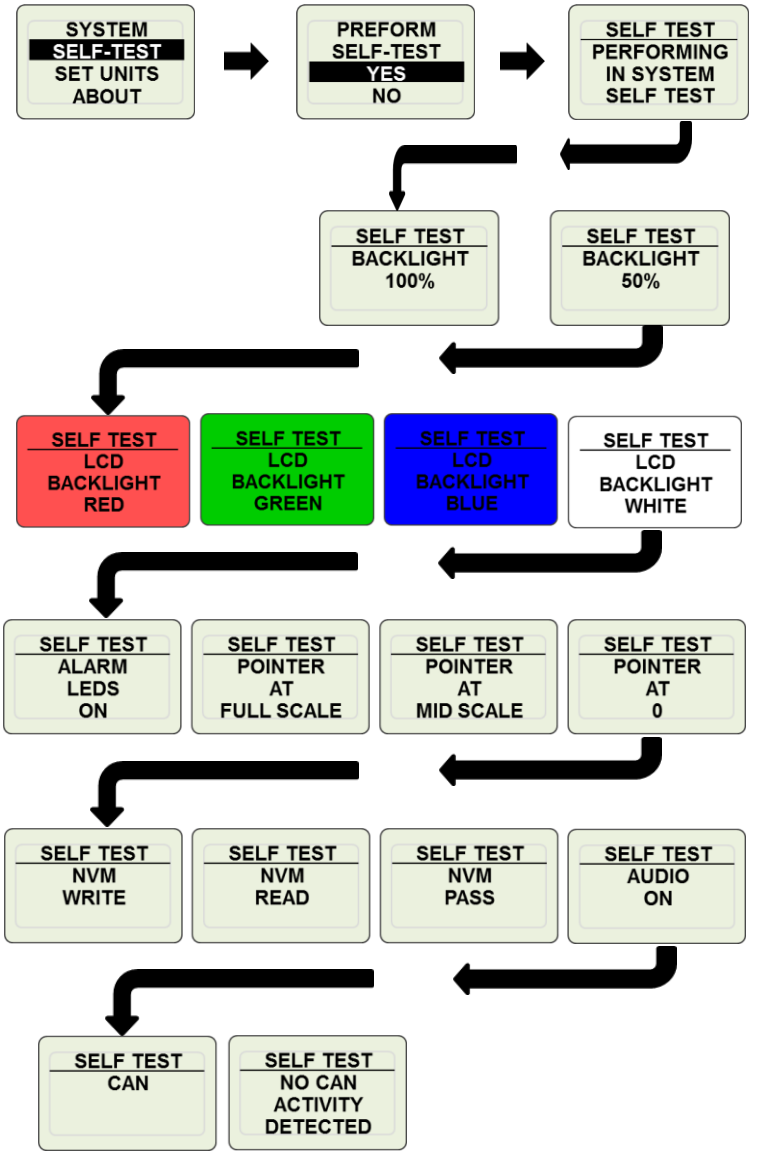
Self-Test

The self-test program allows the user to verify several areas of system operation. The areas tested are; dial/pointer/LCD backlight intensity, LCD backlight color (red, green, blue, white) , alarm LEDs, pointer movement (full-scale, mid-scale, 0), non-volatile (NVM) memory, buzzer and communications channel (CAN).



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To select Self-Test enter the Main Menu and then scroll to the System entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to select System menu. Scroll to "Self-Test" entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to activate the Self-Test program.

Setting Engine Speed

The control system minimum and maximum engine rpm limits are pre-configured from the factory. The minimum engine rpm value is determined by the "Min" speed setting in the Engine menu. The maximum engine rpm value is determined by the "Max" speed setting in the Engine menu. Once configured the control system prevents the user from throttling the engine above or below these values. These settings are passcode protected and should not be change without consulting your Vac-Tron authorized service technician.

Min Engine Speed

To access the "Set Min RPM" setting, enter the Main Menu. Scroll to the "Engine" menu entry using "▼" or "▲" buttons. Press & hold Mode button for > 1 second to select the "Engine" menu entry. Scroll through the "Engine" menu using "▼" or "▲" buttons until "Set Min RPM" entry is highlighted. Press & hold Mode button for > 1 second to select the idle speed entry. Use the "▼" or "▲" buttons to set the minimum engine rpm value. Press & hold Mode button for > 1 second to enter the Min RPM speed entry.

Max Engine Speed

To access the "Set Max RPM" setting, enter the Main Menu. Scroll to the "Engine" menu entry using "▼" or "▲" buttons. Press & hold Mode button for > 1 second to select the "Engine" menu entry. Scroll through the "Engine" menu using "▼" or "▲" buttons until "Set Max RPM" entry is highlighted. Press & hold Mode button for > 1 second to select the run speed entry. Use the "▼" or "▲" buttons to set the maximum engine rpm value. Press & hold Mode button for > 1 second to enter the Max RPM speed entry.

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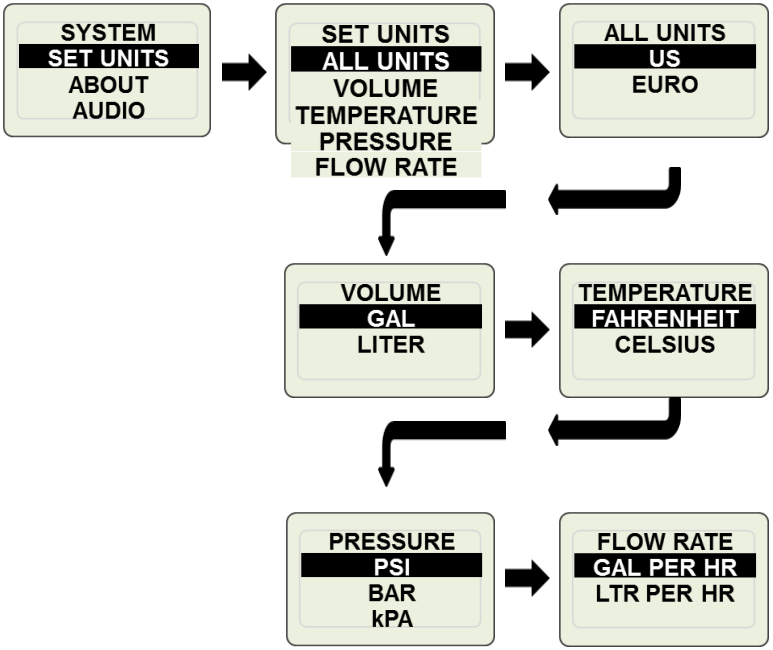
Setting Engineering Units

Engineering units can be configured for the entire M154L System or individual unit categories.

To select engineering units enter the Main Menu and then scroll to the System entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to select System menu. Scroll to the "Set Units" entry using "▼" or "▲"buttons. Press & hold Mode button for > 1 second to enter "Set Units" menu. Use "▼" or "▲"buttons to select the desired configuration. Press & hold Mode button for > 1 second to configure the selected entry. The M154L will immediately convert to the engineering units selected.



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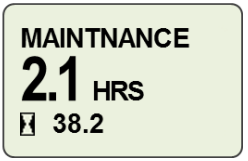
Viewing Data

As shipped from the factory, the M154L contains 21 data displays in the viewing list. These displays can be accessed via the "▼" and "▲" buttons from the runtime menu. This list is called the "Viewing List". The maximum number of displays that can be configured in the "Viewing List" is 18.

Default Startup Display

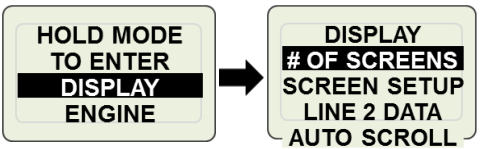
The control system is preconfigured to provide a startup display showing Maintenance hours with engine hours for the line 2 data. To change the startup display enter the display menu and change the "Screen 1" display configuration.



Configuring Display View List

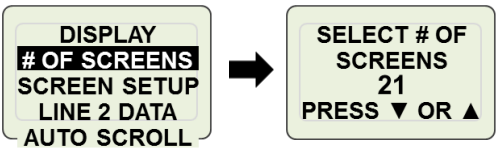
The M154L allows the user to configure a list of displays for viewing. The "Viewing List" is selected from the list of System Displays. Any display contained in the "System Display List" can be assigned to any screen location in the "Viewing List".

To access the Display View List setup, enter Main Menu then scroll to Display entry using "▼" or "▲" buttons. Press & hold Mode button for > 1 second to select the "Display" entry. Use the "▼" or "▲" buttons to select a particular viewing list entry.



View List Screen Count

To configure the number of screens in the View List enter display menu then scroll to "# Of Screens" entry using "▼" or "▲" buttons. Press & hold Mode button for > 1 second to select. Set screen count using "▼" or "▲" buttons. Press & hold Mode button for > 1 second to enter screen count number.



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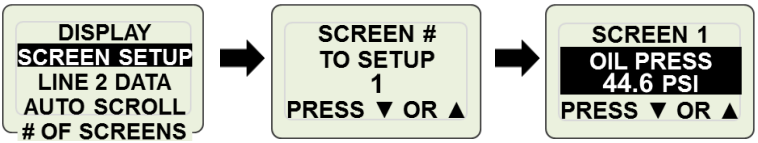
View List Screen Setup

To configure data displays for the viewing list, enter display menu then scroll to “Screen Setup” entry using “▼” or “▲” buttons. Press & hold Mode button for > 1 second to select. Select screen # to be configured using “▼” or “▲” buttons. Press & hold Mode button for > 1 second to select. Select data display using “▼” or “▲” buttons. Press & hold Mode button for > 1 second to enter data display.



See System Display List for a complete list of available data displays.

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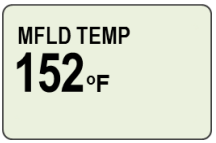
Default Viewing List

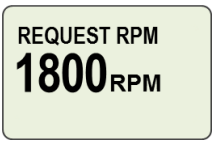
Screen #1

Screen #2

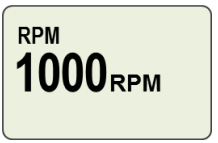
Screen #3



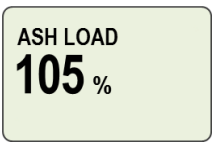
Screen #4



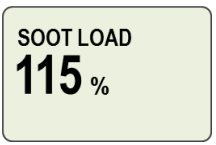
Screen #5



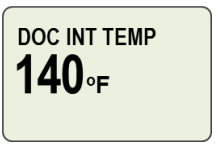
Screen #6



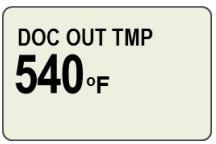
Screen #7



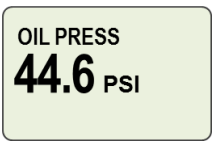
Screen #8



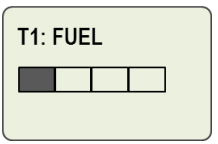
Screen #9



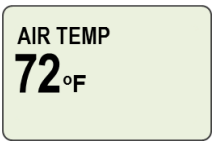
Screen #10



Screen #11

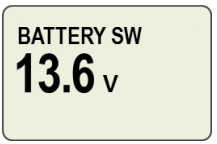


Screen #12

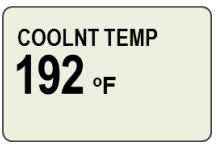


Screen #13

Screen #14

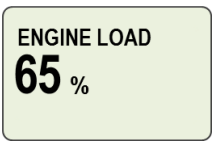


Screen #15

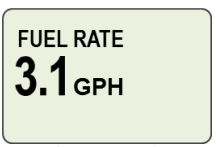


Screen #16

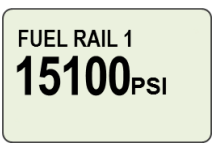
Screen #17



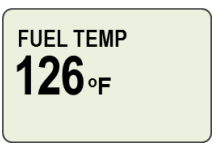
Screen #18



Screen #19



Screen #20



Screen #21

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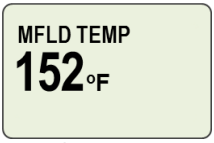
System Display List

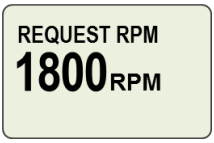
Screen #1

Screen #2

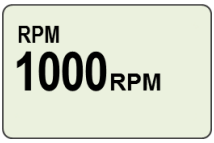
Screen #3



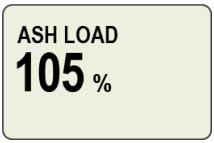
Screen #4



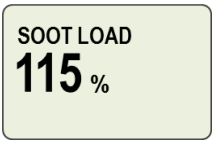
Screen #5



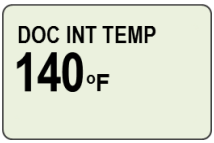
Screen #6



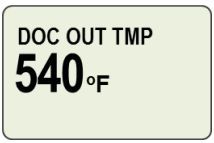
Screen #7



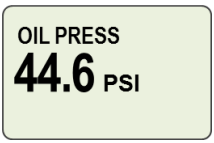
Screen #8



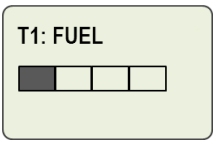
Screen #9



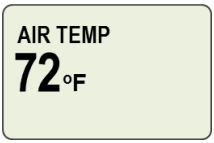
Screen #10



Screen #11

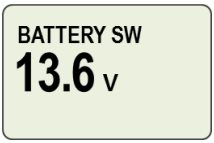


Screen #12

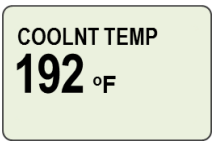


Screen #13

Screen #14

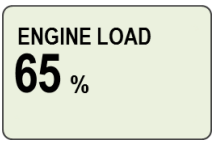


Screen #15

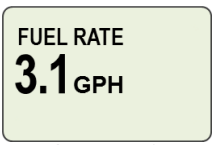


Screen #16

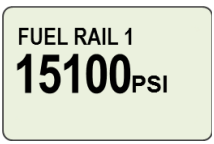
Screen #17



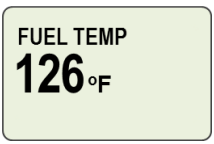
Screen #18



Screen #19



Screen #20



Screen #21

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Line 2 Data (Bar Graph)

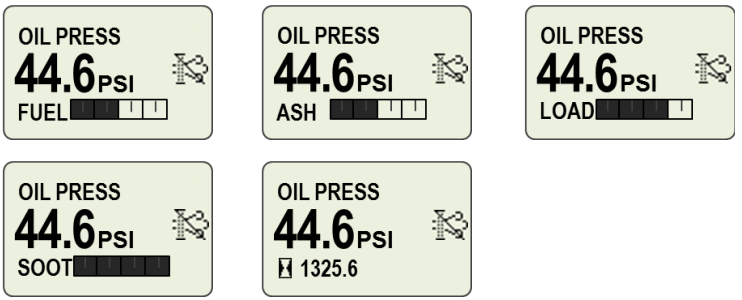
The M154L has the ability to display select data parameters at the bottom of the LCD display. This display is in bar graph form. When activated this feature allows the user to simultaneously display, at the bottom of the screen, the selected data on all screens contained in the “Viewing List”.

Example; Fuel Level Bar Graph Data.

To select the Line 2 Data display enter the display menu then scroll to the “Line 2 Data” entry using “▼” or “▲” buttons. Press & hold Mode button for > 1 second to select. Select data to be viewed using “▼” or “▲” buttons. Press & hold Mode button for > 1 second to enter data selection. Fuel level and engine load can be selected.

Select Bar Graph Data

Bar Graph Display Examples



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Installing the System

⚠ CAUTION

The safety messages that follow have CAUTION level hazards.

ALWAYS ensure the power supply is OFF and battery cables are disconnected before you make any electrical connections.

Making the Connections

The control panel has one round connector with 21 contacts. This connector is an HDP24 Deutsch connector and provides the connection to the engine connector. This connector also provides the user connections for fuel level and oil pressure. The supply power MUST be OFF when interconnecting the system.

Recommended order:

1. Verify the battery / battery switch connections to engine per the engine installation diagram. (Refer to engine manufacturer installation manual.) Verify engine is bonded to battery return (-). Verify engine block is connected to battery ground.
2. Disconnect battery.
3. Install control panel into housing. Attach engine connector to housing using supplied locknut and ring.
4. Fasten control panel to housing using #8 8-32 screws (not supplied).
5. Connect engine harness connector to mating control panel connector (HDP24-21 connector).
6. Connect battery.
7. Turn ignition key to “ON” position.
8. Ensure digital display is active. If display is not active;
   a. Check battery and power connections.
   b. Check the control panel resettable breaker.
   c. Check ignition switch is on position.
9. Ensure system is displaying data for engine speed, oil pressure and temperature.

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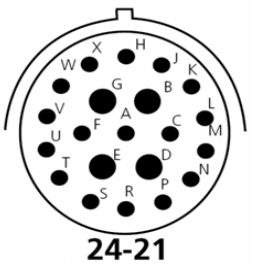
Engine Connector

The engine connector is labeled “Engine” and requires no additional wiring. This connector mates directly to the on-engine harness connector. The table below describes the engine harness connections, associated connector pin number and wire color.



Desc	PIN Number	Engine Harness Connector – P2	Size	Wire Color
N/C	A		16 AWG	Tan
B+	B	Battery + (10A)	16 AWG	Red
N/C	C		16 AWG	Black
Start	D	Starter (30)	16 AWG	Red/Black
Ground	E	Ground	16 AWG	Black
N/C	F			
Ignition Out	G	ECU Power (Ignition)	16 AWG	Violet
N/C	H			
Controller Power	J	ECU Key On	16 AWG	Purple
N/C	K			
N/C	L			
N/C	M			
N/C	N			
Oil Pressure	P	Oil Pressure Sender	16 AWG	Orange
Charge In	R	Charge Lamp	16 AWG	Dark Green
N/C	S		16 AWG	
N/C	T		16 AWG	
CAN Lo	U	CAN Low (twisted pair)	16 AWG	Light Green
CAN Hi	V	CAN High (twisted pair)	16 AWG	Yellow
N/C	W		16 AWG	White/Blue
N/C	X		16 AWG	

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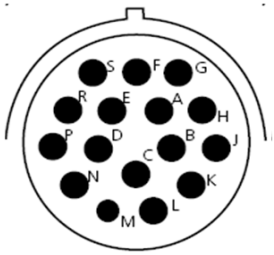
Chassis Connector

The chassis connector is labeled “Chassis” and requires additional wiring for its mating equipment chassis connector. This connector mates directly to the on-chassis harness connector. The table below describes the chassis harness connections, associated connector pin number and wire color.



24-16
16 size 12
N, E

Chassis Connector Wiring Table

PIN Number	Chassis Harness Connector – P1	Size	Wire Color
A	Ground (Lights)	16	Black
B	Work Lights	16	Blue
C	Strobe Lights	16	Red
D	Ground (Main)	16	Black
E		No Connect	
F		No Connect	
G	Hydraulic Pump Power	16	White
H	Pump Clutch	16	Violet
J	Float Switch	16	Green
K	Float Switch	16	Yellow/Red(twist)
L	Sender Ground	16	Tan
M	Fuel Sender Input	16	Green/Black
N	Battery (Main)	16	Red/Blue 30 Amp
P		No Connect	
R		No Connect	
S		No Connect	

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Battery Main

This is a 30A connection and is the main power supply for the control panel and its connected accessories. See wiring diagram for specific details on this input.

Float Switch

The float switch has two connections. The connections are not polarity sensitive and connect to the terminals specified in the wiring table. The float switch connections are controlled via the water pump toggle switch (labeled “Water”) which receives power from the key “ON” circuit. The float switch circuit controls the pump relay. When energized float circuit will allow the pump clutch relay to activate when the water level has reached the minimum level needed to operate the system.

Fuel Level Connection

The Vac-Tron Control Panel will interface with any standard 240-33 ohm US Fuel Sender. See Chassis Connector wiring table for wiring details. Should the sender not be installed and no connection made, the digital display will indicate “---“ for the fuel level measurement value. The control panel will operate BUT will not provide the “Low Fuel” warning.

Hydraulic Pump Power

This connection supplies power to the hydraulic pump. The control panel supplies this power via the main relay when the ignition key is turned “ON”.

Ground (Lights)

The equipment lights are wired to the ground wire labeled lights.

Ground (Main)

The high current accessories (i.e. compressor, pump, etc) are wired to the ground wire labeled main.

Sender Return

The fuel level sender must wired to a separate ground connection. DO NOT connect this ground wire to the Main Ground connection. This ground must be kept separate to ensure the integrity of the sender measurements.

Strobe Lights

This connection supplies power to the strobe lights. The control panel houses a toggle switch and 20A breaker to control the power to strobe lights. The strobe lights are controlled via the toggle switch labeled “lights”.

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Work Lights

This connection supplies power to the work lights. The control panel houses a toggle switch and 20A breaker to control the power to the work lights. The strobe lights are controlled via the toggle switch labeled “Lights”.

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Technical Specifications

System

Pointer	4” 190º 4k Tachometer
Display	Color LCD
Resolution	128 x 64 pixels
Operating Voltage	10.5 to 18VDC
Power Consumption – Tachometer	400 mA max
Power Consumption – Gauge Bus	90 mA max per gauge
Audible Alarm	4 KHZ Internal
External Engine Shutdown	Closure to Gnd
Communication	J1939
Operating Temperature	-20C to +70C (-4F to 158F)
Storage Temperature	-30C to +85C (-22F to 185F)
Reverse Polarity Protection	Yes
Salt Spray	IEC60068-2-52: 1996
EMC	IEC61000 and EN55022
Dimensions (MGT020 Gauge only)	3.375” Dia x 4.29”
System Protection	10A Resettable Circuit Breaker

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Factory Settings

The following system settings will take affect when a master reset is applied.

PARAMETER	DEFAULT VALUE
Display Settings	
# of screens	21
Viewing List configuration	See Default Viewing List
Line 2 Data (Bar Graph)	Engine Hours
Auto Scroll	Off
Engine Settings	
Droop	OFF
Engine Min RPM	1000 RPM
Engine Max RPM	2500 RPM
Oil Pressure Sender Source	10-180 (5 Bar)
Maintenance Timer	250 Hours
Fuel Setup	
Fuel Sender Source	240-33 ohm (USA Sender)
System	
Custom Alarms	Off
Language	English
Set Units	USA units

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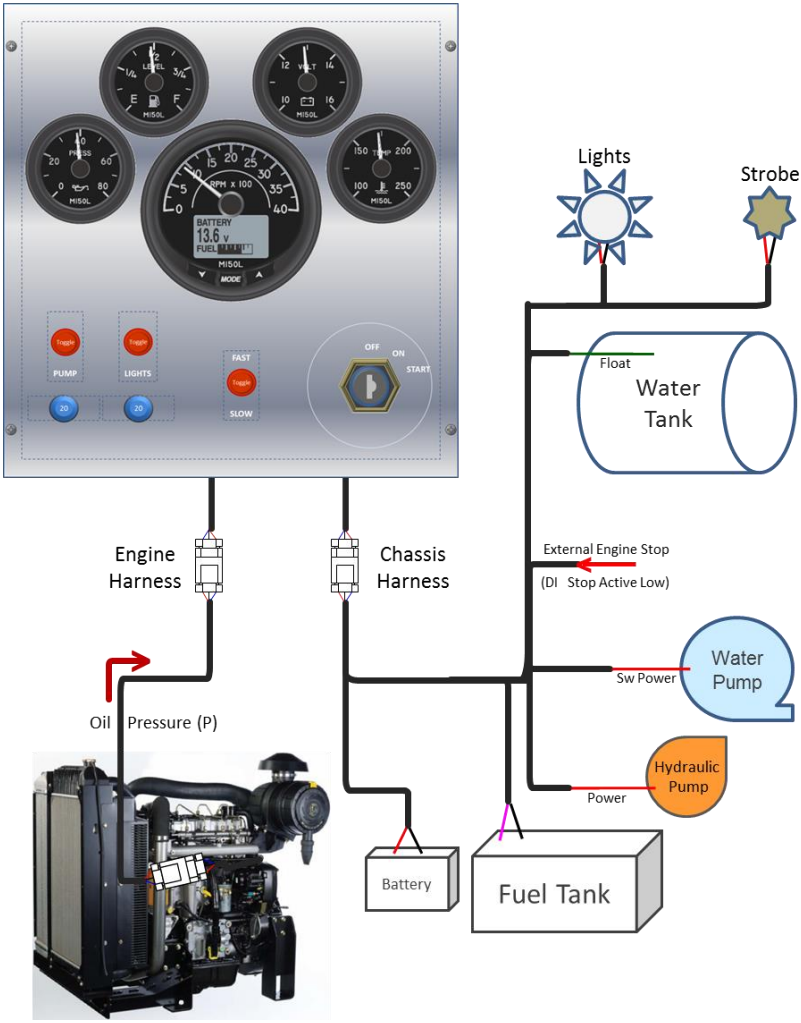
System Block Diagram



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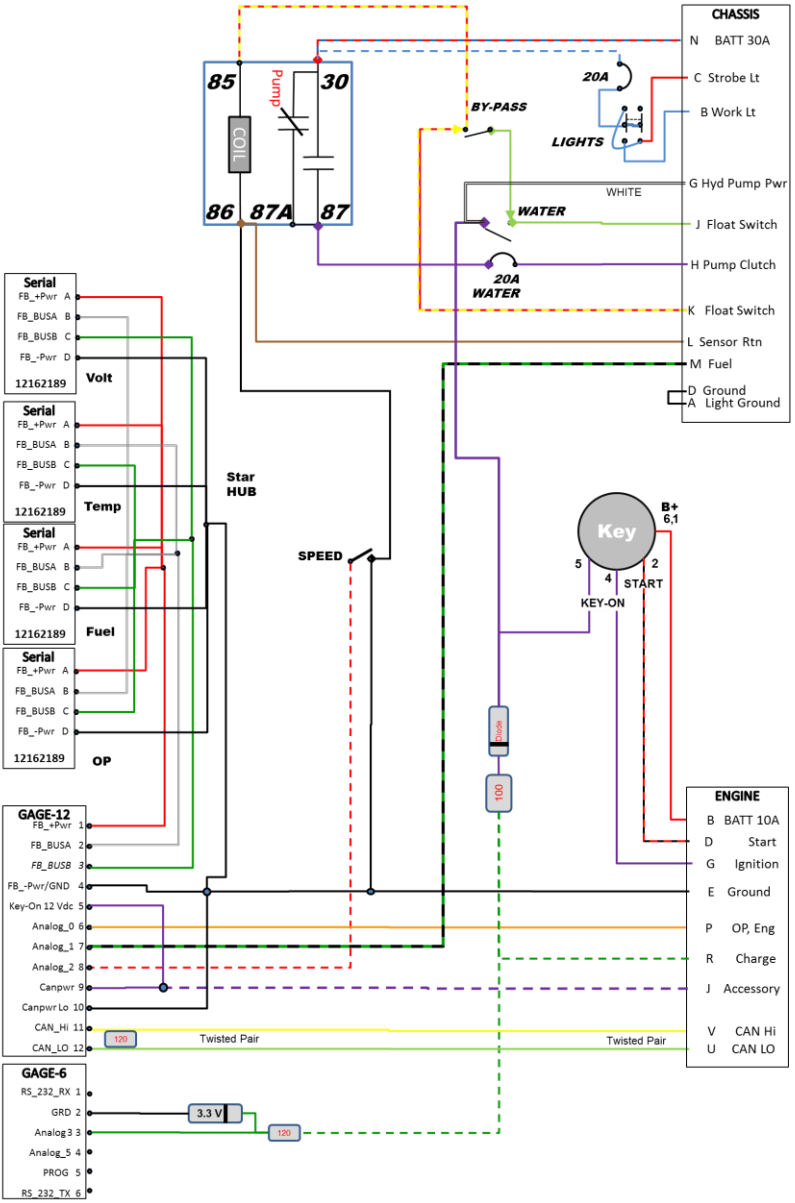
Wiring Diagram



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System Components

PART NUMBER	DESCRIPTION
1100010-10	Control Panel Assembly
1000155-00	Harness; Gauge-Keyswitch-Throttle assembly
1080004-03	Breaker, 20A, Resettable (Lights)
1080004-03	Breaker, 20A, Resettable (Water Pump)
1080004-04	Boot, Push Button, Black
1080004-05	Boot, Switch, Black
DS1111-00Y00	Controller; 4”, 4K Tach w/LCD, Yanmar T4F, Vactron
GE0171	Gauge; 2”, Fuel Level
GE0172	Gauge; 2”, 100 psi Oil Pressure
GE0173	Gauge; 2”, 250 Deg Wtr Temp
VE0028	Gauge; 2”, Volt
1000017-23	Keyswitch, 3 pos, STOP-ON-START
1000151-00	Panel; AL, Blk Pdr Coat, Vactron
1080004-10	Relay, SPST, 50A (pump)
1080004-08	Switch, Toggle, ON-OFF (Fast / Slow)
1080004-08	Switch, Toggle, ON-OFF (Water)
1080004-08	Switch, Toggle, ON-OFF (Air)
1080004-06	Switch, Toggle, (DOT Strobe) ON-OFF-ON*ON (Lights+ DOT Strobe)
1080004-09	Switch, Toggle, ON-OFF, momentary (by-pass)
PJ0036	Plug; 4 pin Packard
MN1000042	User’s Manual

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Troubleshooting Guide

Symptom	Action
Key “ON”; No display or alarm sounded	▪ Verify Battery is connected and battery switch, if installed, is in “ON” position. ▪ Check engine fuse. If fuse blown check engine wiring. ▪ Check engine harness connection at control panel. ▪ Reset circuit breaker
Key “ON”; No display or alarm sounded; Tachometer backlight flashing; No throttle control.	▪ Check engine harness connection at control panel. Engine connector pin W is improperly wired. Pin W MUST be open.
Key “ON”; Alarm sounded but no display.	▪ Check display contrast/lighting level ▪ Replace tachometer gauge
Key “ON”; Display “ON”; Engine data is missing or intermittent.	▪ Check Engine harness connections. ▪ Check main fuse on engine. ▪ Check for active alarms. ▪ Check Diagnostic Trouble Codes.
Key “ON”; Display active and showing data but Engine will not start	▪ Check for system alarms. ▪ Check Diagnostic Trouble Code screen for engine faults. ▪ Check external engine shutdown input.
Key “ON”; Display active, no engine data, Engine will not start	▪ Check for system alarms. ▪ Check Diagnostic Trouble Code screen for engine faults. ▪ Check remote engine shutdown input. ▪ Replace Control Panel.
FAST / SLOW throttle switch does not change engine speed.	▪ Engine Fault. Check DTC screen for specific engine failure. ▪ Ensure Engine Speed settings do not exceed engine manufacturer recommendations.
Engine Speed will not ramp.	▪ Check User Setting menu. Throttle Type set for 2-State.
Engine will not enter regeneration mode	▪ Regeneration is inhibited ▪ Exhaust temperature < 60C ▪ Interlock not set ▪ Engine rpm too high

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Appendix A – Data Supported

Description	Identifier	PGN	SPN
Active DTCs	DM1	65226	
Active DTCs (emissions related)	DM12	65236	
Ambient Temperature	AMB	65269	171
Ash Load Percent	AT1S	64891	3720
Barometric Pressure	AMB	65269	108
Battery Potential Switched	VEP	65271	158
Coolant Temperature	ET1	65262	110
DOC Inlet Temperature		64948	
DOC Outlet Temperature		64946	
DPF Mode Status	Yanmar Prop		3701
DPF Active ReGen Inhibit Switch Status	Yanmar Prop		3703
DPF Auto Active ReGen Init Status	Yanmar Prop		3718
DPF Active ReGen Forced Switch Status	Yanmar Prop		4175
Exhaust Manifold Pressure	IC1	65280	
Engine Hours	HOURS	65253	247
Engine Load	EEC1	61443	92
Engine Stop	Yanmar Prop	65297	
Fuel Level	DD	65276	96
Fuel Rail #1 Pressure	EFL/P2	65243	157
Fuel Rate	LFE	65266	183
Fuel Temperature	ET1	65262	174
Intake Manifold Pressure	IC1	65280	
Intake Manifold Temperature	IC1	65270	105
Key Switch Status	Yanmar Prop	65297	
Oil Pressure	EFL/P1	65263	100
Previously Active DTCs	DM2	65227	
RPM	EEC1	61444	190
Soot Load Percent	AT1S	64891	3719
Throttle Control	TSC1	0000	

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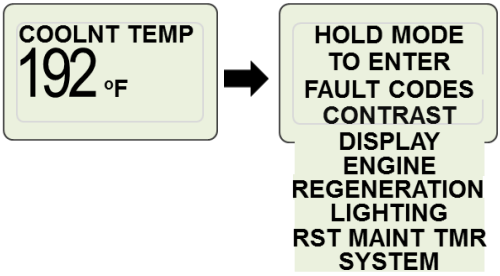
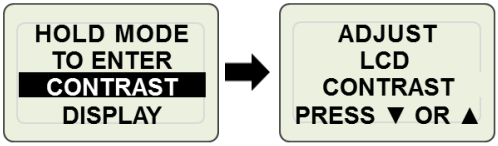
Appendix B - Menu Overview

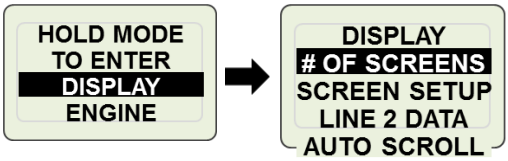
Main Menu



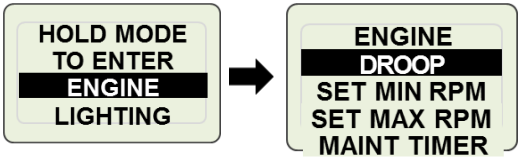
Contrast Menu



Display Menu



Engine Menu



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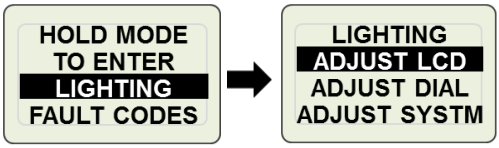
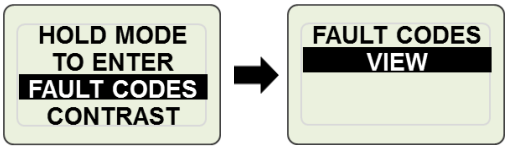
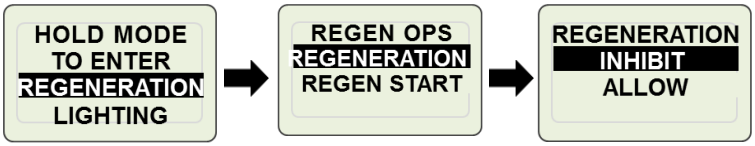
Lighting Menu



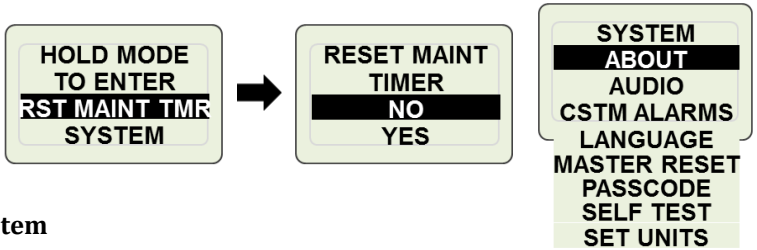
Fault Codes



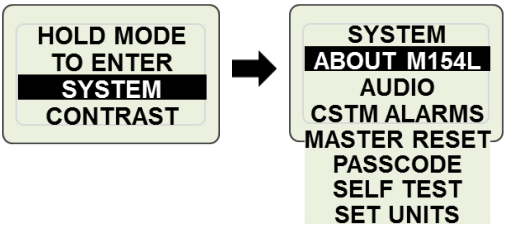
Regeneration



Reset Maintenance Timer



System



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